

Note:

16 APR 1971

PROGRESS PRINT

DATE

19 Etc. work; Interior - None (Later)
12 Etc. work; Exterior - None (Later)

SPECIFICATION
NO. TISP-1
15 APRIL 1971

CONSTRUCTION SPECIFICATIONS FOR MODIF. TO POWER PLANT & ELECTRICAL DIST. SYST.

STATINTL

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SECTION GC - GENERAL CONDITIONS

GC.1 DEFINITIONS:

- (a) The Contract Documents shall consist of the Agreement, the Drawings and Specifications, including all modifications thereof incorporated in the documents before their execution.
- (b) Owner: Government of the United States of America, hereinafter referred to as Government, the Contractor and the Contracting Officer are those mentioned as such in the Agreement.
- (c) Wherever in this Contract the name "Contracting Officer" it shall be understood as referring to the Contracting Officer of the Government

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- (d) The term work includes labor or materials or both, equipment, transportation, or other facilities necessary to complete the Contract.

GC.2 SPECIFICATIONS AND DRAWINGS: The Contractor shall keep at the project site a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as it shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. The intention of the documents is to include all labor, tools, materials, equipment, services and transportation necessary for the proper execution of the work. In case of discrepancy either in the figures, in the drawings, or in the specifications, the matter shall be promptly reported to the Contracting Officer, who shall promptly make a determination in writing.

GC.3 OWNERSHIP OF DRAWINGS AND SPECIFICATIONS: All drawings and specifications are the property of the Government and are not to be used on any other work.

GC.4 CONTRACTOR'S UNDERSTANDING: It is understood and agreed that the Contractor has, by careful examination, satisfied himself as to the nature and location of the work, the character, quality and quantity of materials, the character to equipment and facilities needed for the prosecution of the work, the general and local

conditions, and all other matters which can in any way affect the work under this Contract. No verbal agreement or conversation with any officer, agent or employee of the Government, either before or after the execution of this contract, shall affect or modify any terms or obligations herein contained.

GC.5 PROTECTION OF WORK AND PROPERTY: The Contractor shall continuously maintain adequate protection of all his work from damage and shall protect the Government property from injury or loss arising in connection with this Contract. The Contractor shall make good any such damage, injury or loss, except as may be directly due to errors in the Contract Documents or caused by agents or employees of the Government.

GC.6 INSPECTION OF WORK: The Contracting Officer and his representatives shall be all times have access to the work wherever it is in preparation or progress and the Contractor shall provide proper facilities for such access and for inspection.

GC.7 CONTRACTOR'S SUPERVISION: The Contractor shall keep as the work during its progress a competent superintendent and any necessary assistants, all satisfactory to the Contracting Officer. The superintendent shall not be changed without consent of the Contracting Officer, unless the superintendent leaves the employ of the Contractor. The superintendent shall represent the Contractor in his absence and all directions given to him shall be as binding as if given to the Contractor. Important directions shall be confirmed in writing to the Contractor. The Contractor shall give efficient supervision to the work, using his best skill and attention.

GC.8 CHANGES IN THE WORK: The Government, without invalidating the Contract, may order extra work or make changes by altering, adding to or deducting from the work, the Contract Sum being adjusted accordingly. All such work shall be executed under the conditions of the original Contract except that any claim for extension of time caused thereby shall be adjusted at the time of ordering such change. In giving instructions, the Contracting Officer shall have authority to make minor changes in the work, not involving extra cost, and not inconsistent with the purposes of the work, but otherwise, except in an emergency endangering life or property, no extra work or change shall be made unless in pursuance of a written order by the Contracting Officer, and no claim for an addition to the Contract Sum shall be valid unless so ordered. The value of any such extra work or change shall be determined by one of the following ways:

- (a) By estimate and acceptance in a lump sum.
- (b) By unit price agreed upon between the Contracting Officer and the Contractor.

GC.9 CLAIMS FOR EXTRA COST: If the Contractor claims that any instructions by drawings or otherwise involve extra cost under this Contract, he shall give the Contracting Officer written notice thereof within 10 days after the receipt of such instructions, and in any event before proceeding to execute the work, except in emergency endangering life or property, and the procedure shall then be as provided for changes in the work. No such claim shall be valid unless so made.

GC.10 DEDUCTIONS FOR UNCORRECTED WORK: If the Contracting Officer deems it inexpedient by other means to correct work injured or done not in accordance with the Contract, an equitable deduction from the Contract price shall be made therefor.

GC.11 DELAYS AND EXTENSION OF TIME: If the Contractor be delayed at any time in the progress of the work by any act or neglect of the Government or his employees, or by any other Contractor employed by the Government, or by changes ordered in the work, fire, unusual delay in transportation, or by any cause which the Contracting Officer shall decide to justify the delay, then the time of completion shall be extended for such reasonable time as the Contracting Officer may decide.

GC.12 CORRECTION OF WORK BEFORE FINAL PAYMENT: The Contractor shall promptly remove from the premises all materials condemned by the Contracting Officer as failing to conform to the Contract, whether incorporated in the work or not, and the Contractor shall promptly replace and re-execute his own work in accordance with the Contract and without expense to the Government and shall bear the expense of making good all work of other contractors destroyed or damaged by such removal or replacement.

GC.13 SUSPENSION OF WORK: The Government may at any time suspend the work, or any part thereof by giving two (2) days notice to the Contractor in writing. The work shall be resumed by the Contractor within seven (7) days after the date fixed in the written notice from the Government to the Contractor to do so. The Government shall reimburse the Contractor for expense incurred by the Contractor in connection with the work under this contract as a result of such suspension. But if the work or any part thereof shall be stopped by notice in writing aforesaid, and if the Government does not give notice in writing to the Contractor to resume work at a date within sixty (60) days of the date fixed in the written notice to suspend, then the Contractor may abandon that portion of the work so suspended and he will be entitled to payment for all work done on the portions so abandoned, if any.

GC.14 AS-BUILT CHANGES made during construction shall be recorded by the Contractor on reproducible prints and forwarded to the Contracting Officer at the completion of the contract.

GC.15 GOVERNMENT'S RIGHT TO DO WORK: If the Contractor should neglect to prosecute the work properly or fail to perform any provision of this Contract, the Government, after three days written notice to the Contractor, may, without prejudice to any other remedy he may have, make good such deficiencies, and may deduct the cost thereof from the amount then or thereafter due the Contractor.

GC.16 USE OF COMPLETE PORTIONS: The Government shall have the right to take possession of and use any completed or partially completed portions of the work in accordance with the completion schedule, notwithstanding the time for completion of the entire work but taking possession and use shall not be deemed an acceptance of any work not completed in accordance with the Contract Documents. If such prior use increases the cost or delays the work, the Contractor shall be entitled to such extra compensation, or extension of time, or both, as the Contracting Officer may determine.

GC.17 INDEMNIFY: The Contractor shall indemnify and save harmless the Government against all losses and all claims, demands, payments, suits, actions, recoveries and judgements of every nature and description brought or recovered against him, by reason of any act or omission of the said Contractor, his agents or employees, in the execution of the work or the guarding of it.

GC.18 SEPARATE CONTRACTS: The Government reserves the right to let other contracts in connection with this work. The Contractor shall afford other Contractor's reasonable opportunity for the introduction and storage of their materials and the execution of their work. Wherever work being done by the Government forces or by other contractors is continuous to work covered by this Contract, the respective rights of the various interests involved shall be established by the Contracting Officer to secure the completion of the various portions of the work in general harmony.

GC.19 CONTRACTING OFFICER: The Contracting Officer shall have general supervision and direction of the work. He has authority to stop the work whenever such stoppage may be necessary to insure the proper execution of the Contract. He shall also have authority to reject all work and materials which do not conform to the Contract, to direct the application of forces to any portion of the work, as in his judgement is required, and to order the force increased or diminished.

GC.20 GENERAL INTENTION: It is the declared and acknowledged intention and meaning to provide and secure complete and ready for use the new construction described on the accompanying drawings and these specifications.

GC.21 LOCATION:

The exact location will be given by the Contracting Officer.

GC.22 SECURITY REQUIREMENTS: Security requirements if required shall be the prime responsibility of the Contractor with the help of the Government.

GC.23 MATERIALS AND WORKMANSHIP: Unless otherwise specifically provided for in the specifications, all equipment, materials, and articles incorporated in the work covered by this contract are to be new and of the most suitable grade of their respective kinds for the purpose and all workmanship shall be first class. Where equipment, materials, or articles are referred to in the specifications as "equal to" any particular standard, the Contracting Officer shall decide the question of equality. The Contractor shall furnish to the Contracting Officer for his approval the name of the manufacturer of the machinery, mechanical and other equipment which he contemplates incorporating in the work, together with their performance capacities and other pertinent information. When required by the specifications, or when called for by the Contracting Officer, the Contractor shall furnish the Contracting Officer for approval full information concerning the materials or articles which he contemplates incorporating in the work. Samples of materials shall be submitted for approval when so directed. Machinery, equipment, materials, and articles installed or used without such approval shall be at the risk of subsequent rejection. The Contracting Officer may in writing require the Contractor to remove from the work such employee as the Contracting Officer deems incompetent, careless, insubordinate, or otherwise objectionable, or whose continued employment on the work is deemed by the Contracting Officer to be contrary to the public interest.

GC.24 GUARANTEE: All workmanship, equipment and materials furnished by the Contractor under these specifications shall be guaranteed for a minimum period of one (1) year from the date of final acceptance thereof against all defects that might render the work unsatisfactory for the intended purpose. Defective materials and workmanship will be replaced by the Contractor without additional cost to the Government. The guarantee shall be in writing on the Contractor's own letterhead in the form specified by the Contracting Officer.

GC.25 CUSTOMS DUTIES AND PURCHASE TAXES: The Contractor shall pay all import duties and taxes resulting from the purchase of goods and/or service, for use in the construction or execution of this contract.

GC.26 BLUEPRINTS FURNISHED CONTRACTOR: The Contractor will be furnished 3 sets of blueprints upon the execution of the contract. Additional prints in excess of this quantity will be provided by the Contracting Officer at nominal cost per print. One complete set of plans and specifications shall at all times be available at the site.

GC.25 WORK OUTSIDE REGULAR HOURS: If the contractor desires to carry on work outside of the regular hours, he may submit application to the Contracting Officer but shall allow ample time to enable satisfactory arrangements to be made by the Contracting Officer for inspecting the work in progress.

GC.28 SHOP DRAWINGS: The Contractor shall submit shop drawings as required by the specifications or otherwise requested by the Contracting Officer. These shop drawings and all supporting data, catalogs, brochures, etc, shall be prepared by the Contractor or his suppliers, but shall be submitted as the instruments of the Contractor. The Contractor shall ascertain that the drawings meet all requirements of the contract drawings and also conform to the structural and space conditions. All shop drawings shall be subject to the approval of the Contracting Officer.

GC.29 SPECIFICATIONS AND STANDARDS: Other specifications and standards are referred to in this specification, and shall govern in all cases where such reference occur. In case of difference between such other specifications or standards and this specification, or its accompanying drawings, this specification or its accompanying drawings and standards shall apply.

GC.30 OPTIONAL REQUIREMENTS: Where a choice of materials and/or methods is permitted herein, the Contractor will be given the right to exercise the option unless stated specifically otherwise.

GC.31 DEFINITIONS: Where "as shown", "as indicated", "as described", or words of similar import are used, it shall be understood that reference to the drawings accompanying this specification is made unless stated otherwise. Where "as directed", "as required", "as permitted", "approved", or words of similar import are used, it shall be understood that the direction, requirements, permission, approval, or acceptance of the Contracting Officer is intended unless otherwise stated. As used herein, "provided", "provision of", and "providing of" shall be understood to mean "provided complete in place", that is furnished and installed. For the purpose of these specifications, the word "shall" indicates mandatory requirements; the word "should" indicates recommended practices.

GC.32 TEMPORARY LIGHT, WATER, POWER, AND SANITARY FACILITIES: The Contractor shall provide at his own expense light, power and water facilities for his use for construction. Water supply connections and pipings shall be installed only at such locations and in such manner as may be approved by the Contracting Officer. All temporary connections for electricity shall be subject to the approval of the Contracting Officer. Sanitary facilities for the use of the Contractor shall be installed only at locations approved by the Contracting Officer. Before final acceptance, temporary connections and piping and electric lines installed by the Contractor shall be removed in a manner satisfactory to the Contracting Officer. Temporary latrines shall be filled with materials obtained from borrow pits and compacted thoroughly in a manner satisfactory to the Contracting Officer.

GC.33 FORM OF CONTRACT: The Contract will be executed on the Agreement Form provided, copy of said form is attached to this specification for information purposes only.

GC.34 PERFORMANCE BOND: Performance and payment bonds will not be required.

GC.35 INSURANCE REQUIRED: The Contractor shall procure and shall maintain during the entire period of performance under this contract the following minimum insurance. Comprehensive General Liability and Automobile Liability, in each instance for bodily injury and property damage in amounts of not less than \$50,000 per person and \$100,000 per accident for bodily injury, and not less than \$200,000 for property damage. Prior to the commencement of work hereunder evidence of insurance shall be furnished in a form satisfactory to the Contracting Officer. In addition, the Contractor shall furnish evidence of a commitment by the insurance company to notify the Contracting Officer in writing of any material change, expiration or cancellation of any of the insurance policies required hereunder not less than 30 days before such change, expiration or cancellation is effective.

GC.36 SAFETY REQUIREMENTS: The Contractor shall provide safety controls for protection to the life and health of employees and other persons; for prevention of damage to property, materials, supplies, and equipment; and for avoidance of work interruptions in the performance of this contract. Prior to commencement of work, the Contractor shall meet in conference with the Contracting Officer to discuss and develop mutual understanding relative to administration of the safety program.

GC.37 PROGRESS CHARTS: The Contractor shall within five (5) days or within such time as determined by the Contracting Officer, after date of commencement of work, prepare and submit to the Contracting Officer for approval a practicable schedule, showing the order in which the Contractor proposes to carry on the work,

the date on which he will start the several salient features (including the procurement of materials and equipment) and the scheduled dates for completing the same. The schedule shall be in the form of a progress chart of suitable scale to indicate approximately the percentage of work scheduled for completion at any time. The Contractor shall enter on the chart the actual progress at the end of each work or at such intervals as directed by the Contracting Officer and shall deliver to the Contracting Officer three copies thereof.

GC.38 TIME FOR COMPLETION: The Contractor shall commence construction upon written notice to proceed, and shall complete all work within 150 calendar days from the date of the notice to proceed.

GC.39 COST BREAKDOWN: The Contractor shall within five days after execution of the Contract submit in a form acceptable to the Contracting Officer a schedule showing the subdivision of his contract consideration into its various component parts, this schedule will be the basis of computing progress payments. No payments will be made to the Contractor until such schedule has been submitted and approved by the Contracting Officer.

GC.40 DAMAGES FOR DELAY: The Contractor agrees to pay liquidated damages at the rate of [REDACTED] per calendar day for each day after the specified completion dates until the work is completed.

GC.41 FORM OF PAYMENT: Payment made to the Contractor shall be made in [REDACTED]

GC.42 PARTIAL PAYMENTS: The Contractor shall submit by 20 per cent incremental stages requests for partial payment based on the cost breakdown previously submitted complete with waivers for labor and material. Said requests will be certified by the Contracting Officer to the Government and payment made to the Contractor of the amount so certified within fifteen days. Said partial payment shall be for the amount certified less 10 per cent retained percentage will be made 30 days after final acceptance of the work and receipt of full waivers of lien and affidavit.

GC.43 FINAL CLEAN-UP: The Contractor shall, as directed by the Contracting Officer, remove from the buildings and site, at his own expense, all rubbish and waste materials resulting from his operations and leave the premises in a clean and orderly condition.

GC.44 CONTROLLING LANGUAGE: All matters in connection with the execution of this contract shall be in the English language. These matters shall include, but not be limited to, correspondence, drawings, specifications, technical data and conferences. Wherever any of these items are bilingual the English language shall be controlling.

- End of Section -

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SECTION 1 - SITE PREPARATION

- 1.1 GENERAL REQUIREMENTS: The work includes the clearing and grubbing within the construction limits shown, and the disposal of waste material resulting therefrom.
- 1.2 CLEARING: Brush and other vegetation shall be cut off flush with, the original ground surface.
- 1.3 GRUBBING: Tree stumps shall be removed entirely. Tree roots and matted roots of brush shall be grubbed out to a depth of not less than 60 cm. below the finished subgrade for building and to a depth of not less than 30 cm. for other locations.
- 1.4 WASTE AND DEBRIS shall not be disposed of by piling it up along the limits of the area required to be cleared.
- 1.4.1 Non-Combustible waste and debris shall be gathered and disposed of as directed.
- 1.4.2 Combustible waste and debris shall be gathered for burning, except that when permitted (in writing) by the Contracting Officer, logs, and larger stumps may be removed and disposed of without burning at locations out of sight of public view.
- 1.4.2.1 Locations for Burning shall be either in the cleared area near the center or in adjacent open areas where existing trees or other vegetation will not be harmed.
- 1.4.2.2 Regulations of the local fire authority shall be complied with regarding burning methods. Fires shall be kept under constant attendance until the fires have burned out or have been extinguished.
- 1.4.2.3 Ashes shall be disposed of as for non-combustible material.
- 1.4.2.4 Private Property: Permission to dispose of waste and debris on private property shall be in writing. A copy of the permit shall be filed with Contracting Officer for approval.
- 1.4.2.5 Rehandling: When conditions are not suitable for burning operations and waste material interferes with subsequent construction, such material shall be moved to locations clear of construction operations and later rehandled and burned or disposed of at approved locations at all times.

- End of Section -

SECTION 2 - EARTHWORK AND STORM DRAINAGE

2.1 GENERAL REQUIREMENTS: The work includes excavation, embankment construction, trenching and backfill for utilities systems, watering, backfilling, storm drainage, and subgrade preparation complete.

2.2 PREPARATION OF AREA: Prior to the commencement of earthwork operations, areas to be excavated, or on which embankment is to be placed, shall be timbered, cleared, grubbed, and scalped as required, as specified in SECTION: SITE PREPARATION. Earthwork shall not commence until an area has been prepared which is sufficient to allow efficient and uninterrupted progress. Areas preparation shall proceed sufficiently in advance of earthwork so as to preclude hindrance of either operation.

2.3 EXCAVATION FOR CONDUIT AND DIRECT BURIAL CABLE shall be done as necessary for installation of direct burial cable, conduit, boxes, structures and foundations along the alignments and grades shown and with sides approximately vertical. Cable trenches shall not be excavated by the use of cable plows or other blade equipment. Trenches for conduit and direct burial cable shall have a minimum depth of 60 cm. and a minimum width of 30 cm. Trenches shall be in straight lines between cable connections, and bends in trenches shall have a radius of not less than 1 meter. Rocks shall be removed to a depth of not less than 7.5 cm. below the cable or conduit depth and the space shall be filled with sand to provide a cushion. Such grading shall be done as may be necessary to prevent surface water from flowing into trenches.

2.4 EXCAVATION FOR DRAINAGE DITCHES shall be performed to secure a finished ditch, true to line, elevation, grade, and cross section as shown, with no under cutting or irregularity of the flow line. Work shall be performed in the proper sequence with other construction. Intercepting ditches shall be constructed prior to the start of adjacent excavation operation. Where necessary, sufficient openings shall be provided through spoil banks to permit drainage from adjacent areas. Ditches shall be maintained to the required cross section, and shall be kept free from debris or obstructions until the contract is complete.

2.5 FILLING AND BACKFILLING:

2.5.1 Material shall consist of suitable excavated material or borrow of earth, sand, gravel, or other approved materials, and shall be free of roots, wood scrap material, other vegetable matter and refuse.

2.5.2 Fill or Backfill for Buildings and Structures shall be placed, as far as practicable, as the work of construction progresses. Backfilling against concrete shall be done only when directed. Backfill shall be placed in horizontal layers not more than 15 cm. in loose thickness, with each layer being compacted as specified.

2.5.3 Conduit and Direct Burial Cable Not Encased in Concrete shall be surrounded on all sides, top, and bottom with sand at least 10 cm. thick. Sand shall be clean, hard, mineral aggregate with 100 per cent passing a No. 10 mesh sieve and not more than 5 per cent passing a No. 100 sieve. Large sharp edged particles of sand or any other material injurious to the cable or connections shall not be included in the sand bed for direct burial cable. The remainder of backfill shall be disposed of as directed.

2.5.4 Fill or Backfill for Pipe Culverts shall be placed as specified or as directed. Particular care shall be taken to obtain the required compaction under the haunch of the culvert.

2.6 CONSTRUCTION OF EMBANKMENT:

2.6.1 Material shall consist of suitable excavated material, or borrow of earth, sand, gravel or other approved materials and shall be free from organic and other objectionable materials. The size of individual particles shall be governed by the thickness of lifts placed and shall be such that no particle shall be greater than two-thirds the compacted thickness of the lift.

2.6.2 Grade Control: The lines and grade shall be established by the Contractor and shall be maintained by means of grade stakes placed in lanes parallel to the center lines of the areas to be filled and spaced so that the string lines may be stretched between stakes. All lines and grades will be checked by the Contracting Officer, but such check will not relieve the Contractor of full responsibility for the correctness thereof.

2.6.3 Layers: Embankments shall be formed of suitable materials placed in successive horizontal layers of not more than 15 cm. in compacted depth for the full width of the cross section. Starting layers shall be placed in the deepest portion of the fill. Layers shall be constructed approximately parallel to the finished grade line.

2.6.4 Stability of Embankments: The top of the embankment shall be kept in such condition that it will drain readily and effectively. Ruts shall be corrected by reshaping and rerolling. The Contractor shall be responsible for the stability of all embankments made under the contract and shall replace any portion which, in the opinion of the Contracting Officer, has become displaced due to carelessness or negligence on the part of the Contractor.

2.7 COMPACTION:

2.7.1 Compaction in Cut Areas: The material shall be compacted to a density of not less than 95 per cent of the maximum density determined as specified.

2.7.2 Compaction of Embankments: Embankments shall be compacted to 90 per cent of the maximum density in all but the top 15 cm., which shall be compacted to not less than 95 per cent of the maximum density.

2.8 TESTS: All tests required by the Contractor to control the quality of the work, and as specified hereinafter, shall be made by the Contractor under the supervision of the Contracting Officer by and at the expense of the Contractor.

2.9 ACCEPTANCE OF SUBGRADE OR EMBANKMENT: Each lift or embankment material placed by the Contractor shall be subject to approval. No surface course material shall be placed on a prepared subgrade or on an embankment without the prior approval of the subgrade or embankment by the Contracting Officer.

2.10 STORM DRAINAGE: Storm drainage pipes and other materials shall be as approved by the Contracting Officer.

2.11 INSTALLATION OF CONCRETE PIPE:

2.11.1 Direction of Laying: Units shall be laid upgrade with the tongue end of tongue-and-groove pipe pointing in the direction of flow; units shall be laid to the grades and alignment shown.

2.11.2 Lowering: Proper facilities shall be provided for lowering units into trenches.

2.11.3 Bedding: The bedding surface shall provide a firm foundation of uniform density throughout the entire length. Soft, spongy, or otherwise unstable material encountered that will not provide a firm foundation for the pipe, shall be removed and replaced by suitable material to a depth of not less than 30 cm. Unless otherwise specified, all such unstable materials under the pipe shall be removed for the full width of the trench and replaced with suitable selected material. The exterior of the pipe or not less than 1/4 of its circumference shall be bedded in an earth foundation of uniform density. Select material shall be used for pipe bedding, when indicated on the drawings.

2.11.4 Mortar: Mortar shall be a mixture of portland cement, sand, and water mixed in the proportion by volume of 1 part portland cement to two parts of clean sand. Water in the mix shall not exceed 6 gallons per sack of cement. Mortar shall be used within 30 minutes from the time the ingredients are mixed with water.

2.11.5 Tongue-and-Groove Joints: The first unit shall be properly bedded. A shallow excavation shall be made underneath the unit at the joint and filled with mortar to provide a bed for the second. The grooved end of the first unit shall be carefully cleaned with a wet brush, and a layer of soft mortar applied to the lower half of the groove. The tongue of the second pipe shall be cleaned carefully with a wet brush, and while in a horizontal position, a layer of soft mortar shall be applied to the upper half of the tongue. The tongue end of the second unit shall be inserted in the grooved end of the first, until mortar is squeezed out on the interior and exterior surfaces. Sufficient mortar shall be used to completely fill the joint and to form a bead on the outside. The interior surface of the units at the joint shall then be brushed smooth. The mortar on the outside shall immediately be protected from the air and sun with a cover of wet burlap or wet earth, and shall be kept protected until the mortar is satisfactorily cured.

2.12 CLEAN: As the work progresses, the interior of the pipe shall be kept clean of all dirt and superfluous materials. Where pipe sizes are small, a suitable swab or drag shall be kept in the pipe and pulled forward past each joint immediately after the jointing has been completed.

2.13 HEADWALLS AND GROUTED STONE RIPRAP shall be constructed as shown. Except where otherwise shown, concrete headwalls shall have a compressive strength of not less than 2,500 psi (175 kg./sq.cm.) in 28 days, and shall conform to the applicable requirements of SECTION: CONCRETE FOR STRUCTURES. Grouted Stone Riprap shall be constructed in conformance with applicable requirements of SECTION: STONE PROTECTION (DRY LAID AND GROUTED).

- End of Section -

SECTION 3 - RESERVOIR (FUEL STORAGE TANKS)

3.1 EXCAVATION FOR DRAINAGE DITCHES: Excavation for drainage ditch around Fuel Storage Tanks shall conform to lines, grades and sections as shown. Ditch shall be paved with grouted rubble to thickness and shape shown and in accordance with applicable requirements of SECTION ENTITLED STONE WORK.

3.2 BERM EMBANKMENT MATERIAL around fuel storage tanks shall be select, cohesive material having a minimum plasticity index of not less than 10 nor more than 30 when tested in accordance with ASTM D424-59 and shall be free from deleterious organic matter, trash, debris, and stones heavier than 10 pounds or larger than six inches. The larger stones shall be predominantly limited to the lower center of fills. Berm embankment shall be constructed in 0.15 meters lift with each layer compacted to 95% of the maximum density throughout.

3.3 HERBICIDE TREATMENT: After compacting the top of berm, interior side slope and tank pad an approved herbicide to control weed growth, consisting of a mixture of diesel fuel containing 1 1/2 per cent of pentachlorephenol shall be sprayed thoroughly at the rate of two-thirds to one gallon per square yard.

3.4 SURFACE TREATMENT after herbicide application shall be as follows:

3.4.1 For Interior Slope and Top of Berm: Pave these areas with 0.075 meter thick aggregate consisting of clean, tough durable rock free from dirt, organic and other foreign matter. All sizes shall have at least one fractural face and when tested by ASTM C131-35 shall show not more than 35 per cent of wear. Aggregates to be used shall have a gradation as follows:

<u>Sieve Size</u>	<u>Per cent Passing (by weight)</u>	
	<u>Aggregates</u>	
	<u>Key</u>	<u>Fine</u>
1"	100	
3/4"	90-100	
3/8"	20-25	100
No. 4	0-10	85-100
No. 8	0-5	10-40
No. 16		0-10
No. 50		0-5

Paving shall proceed as follows: After herbicide treatment, apply hot bituminous asphalt material consisting of slow curing cut-back asphalt conforming to Federal Specifications SS-A-671a(1) at the rate of 0.5 gallons per square yard. Following this first application of bituminous material while bitumen is still warm and plastic, spread clean, dry key aggregate uniformly over the compacted surfaces. After spreading the key aggregate, tamping shall be done and continued until the course is firmly bonded together and the surface is smooth and shows no movement under the tamping tool. A second application of the bituminous material at the rate of 0.5 gallons per square yard shall be applied as follows. Immediately thereafter with fine aggregate placed in similar manner as the key aggregate. Brooming and tamping shall be done until all interstices between the key aggregate fragments are filled. The finished surface shall be constructed so as not to vary more than 1 centimeter in 3 meters from the required section.

3.4.2 For Tank Pad: After herbicide treatment pave this area with 0.10 meter thick crushed rock or broken stones 1-inch to 2-inch in size.

3.4.3 For Interior Berm Drainage Ditch: No herbicide treatment required. Pave ditch with 0.15 thick grouted stone.

3.4.4 For Outside Berm Slope: No herbicide treatment required. Sodding for erosion control shall be applied.

-- End of Section --

SECTION 4 - ESTABLISHMENT OF TURF

4.1 GENERAL REQUIREMENTS: The work includes providing topsoil, and sodding, complete.

4.2 MATERIALS:

4.2.1 Topsoil shall be obtained from stock piles and/or suitable approved topsoil "borrow areas". Topsoil to be provided by the contractor shall be natural, friable soil possessing the characteristics of representative soils in the vicinity that produce heavy growths of crops, grass, or other vegetation and shall be obtained from naturally well-drained areas. The topsoil shall be reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and shall be free from stones, stumps, and other objects larger than 5 cm. in diameter, from roots and toxic substances, and any other material or substance that might be harmful to plant growth or be a hindrance to grading, planting and maintenance operations.

4.2.2 Weed Eradicator and Soil Fumigant shall be sodium methyal dithicarbamate for eradication of weeds, germinating weed seeds, fungi, insects, and soil pests. Each gallon of material shall contain 0.5 kilogram of active ingredient per liter.

4.2.3 Fertilizer shall be as approved by the Contracting Officer.

4.2.4 Sod shall contain a heavy thickly matted cover of living or growing grasses reasonably dormant during the dry season, and capable of renewing growth thereafter. Unless otherwise shown, sod shall be obtained from approved, off-site locations having similar growing conditions as the area to be treated. Sod shall be free of weeds or undesirable plants, large stones, roots, or other objects larger than 5 cm. in diameter. When sod is procured, grass height shall not exceed 12 cm. and adhering soil shall be sufficient to support thriving plant growth.

4.2.5 Water shall be free from oil, acid, alkali, salt, and other substances harmful to plant growth. The source shall be subject to approval prior to use.

4.3 INSPECTION AND TESTS: Topsoil, and sod, will be inspected to determine their suitability for use in the work. No material shall be placed without the approval of the Contracting Officer.

4.4 PREPARATORY WORK:

4.4.1 Tillage: After areas to be topsoiled have been cleared, grubbed, and/or brought to grades shown on drawings, and prior to dumping and spreading of the topsoil,

the entire area shall be examined. All areas found excessively compacted, irrespective of the cause, shall be loosened to a depth of at least 15 cm. to permit bonding of the topsoil.

4.5 TOPSOIL SPREADING:

4.5.1 Placing: Topsoil shall not be placed when the sub-grade is excessively wet, extremely dry, or in a condition detrimental to the finished planting. The topsoil shall be dumped in piles uniformly spaced and shall be spread evenly over the entire area to provide a minimum depth of 10 cm. Low spots, pockets or other irregularities in the surface that permit the accumulation or ponding of water shall be properly filled and graded to a uniform slope.

4.5.2 Cleanup: After the topsoil have been spread and graded as required, the surface shall be cleared of stones, stumps, or other objects larger than 5 centimeters in thickness or diameter, and or roots, brush, wire, grade stakes, or other objects that might be a hindrance to planting or maintenance operations. Paved areas over which hauling operations are conducted shall be kept clean, and topsoil or other dirt that may be brought upon the surfacing shall be removed promptly.

4.5.3 Weed Eradication, Soil Fumigation, and Pre-Fertilization: Topsoil shall be maintained in a moistened condition to the desired depth by fine spraying without puddling or erosion for a period of 5 to 7 days to stimulate the germination of weed seeds. Weed eradicant and soil fumigant shall then be applied at the rate of 1 liter to 55 to 110 liters of water for every 10 square meters.

4.5.4 Pre-Fertilization: Not less than 15 days after the application of the weed eradicant and soil fumigant, soluble fertilizer shall be uniformly spread at a rate that will assure 1 kilogram of nitrogen per each 100 square meters of top soil (2 kilograms 10-10-10 per 100 square meters). After spreading, the pre-fertilizer shall be kept well moistened without puddles or erosion until the fertilizer has been dissolved.

4.6 SODDING:

4.6.1 Procuring Sod: After approval of the source, sod shall be cut into squares or into rectangular sections. Rectangular sections may vary in length but shall be of equal width and of a size that will permit them to be lifted and rolled without breaking. Care shall be exercised to retain native soil on the roots during the process of stripping, transporting, and planting. Dumping from vehicles will not be permitted. During delivery and while in stacks sod shall be kept moist. Sod which has been damaged by handling will be rejected.

4.6.2 Finishing: After the sodding operation has been completed, the edges of the area shall be smooth and the area rolled lightly to obtain an even surface free of hollows or protruding areas. Excess material shall be spread uniformly over adjacent areas or disposed of as directed. When so indicated, sod shall be fastened in place with suitable wooden pins. Watering and repair shall be to the satisfaction of the Contracting Officer.

4.7 CONTRACTOR'S RESPONSIBILITY: The Contractor shall protect the planted area during the time when vegetation is becoming established. If objectionable weeds or other undesirable growths threaten to smother the planted species, such vegetation shall be removed from the area.

- End of Section -

SECTION 5 - FENCING: CHAIN-LINK

5.1 GENERAL REQUIREMENTS: The work includes providing chain-link fences and gates, as shown, complete.

5.2 MATERIALS: All materials shall be as approved by the Contracting Officer.

5.3 INSTALLATION:

5.3.1 Post Holes shall be to depth shown, and shall be accurately centered along the line of the fence.

5.3.2 Setting of Posts: Post shall be set to proper elevation along the line of the fence and in the center of the excavation or the concrete footing. Concrete shall develop a strength not less than 3,000 pounds per square inch, (210 kilograms per cm²) at 28 days, and shall conform to the applicable provisions of SECTION: CONCRETE FOR STRUCTURES. The posts shall be braced in a true and plumb position until the concrete has been poured and allowed to harden.

5.3.3 Top Rails shall not be installed until the concrete footing around the posts is sufficiently cured.

5.3.4 Chain-Link Fabric shall be stretched taut. Sufficient stress shall be applied to the fabric to take up all slack and present a smooth uniform surface along the line of the fence. Tension on each side of posts shall be equal. Distortion of the fabric by over-stretching shall be avoided. Unless otherwise shown fabric shall be secured to posts and top rail with suitable clips or wire ties not more than 30 cm. on center on posts. Lengths of fabric shall be carefully connected, and the connecting wire shall be selvaged to conform to the fabric.

5.3.5 Barbed Wire shall be installed in locations, as shown, and shall be stretched taut. Fastenings shall be installed in such manner as to prevent wire from growing slack.

5.3.6 Braces, unless otherwise shown, shall be placed horizontally at midheight of the fabric and shall extend from end, corner and gate posts to the first adjoining line post. A rod, with turnbuckle for adjustment, shall extend back to the end, corner or gate post, and shall be placed diagonally in tension.

5.3.7 Gates shall be hung and properly adjusted after fencing is erected. The gates shall be adjusted to hang level and true to the fence. Chain-link fabric for gates shall be as specified for the fence. All hardware shall be secured, properly adjusted and left in perfect working order.

5.3.8 Grounding of fencing shall be as shown.

5.4 SIGNS: Porcelain enameled steel signs warning of high voltage both

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- End of Section -

SECTION 6 - STONE PROTECTION (DRY-LAID AND GROUTED)

6.1 GENERAL REQUIREMENTS: The work includes providing stone protection work, complete.

6.2 MATERIAL:

6.2.1 Stone shall be dense, hard, sound and durable and of a suitable quality to insure permanence in the structure, procured from approved local sources. It shall be free from cracks, seams, and other defects that would tend to increase unduly its deterioration from natural causes. The inclusion of objectionable quantities of dirt, sand, clay, and rock fines will not be permitted. The individual stones, except for filling stones in dry stonework, shall have a thickness of not less than 7.6 cm. and a width of not less than one and one-half times the thickness (11.4 cm.). No stone shall have a length less than one and one-half times its width.

6.2.2 Quality: Suitable tests and service records will be used to determine the acceptability of the stone protection materials. In the event suitable test reports and a service record, that are satisfactory, are not available, as in the case of newly operated sources, the material shall be subjected to such tests as are necessary to determine its acceptability for use in the work. Tests to which the materials may be subjected include petrographic analysis, specific gravity, abrasion, absorption wetting and drying, and such other tests as may be considered necessary to demonstrate satisfactorily that the materials are acceptable for use in the work.

6.3 STONework shall be laid dry or grouted as shown. Interstices of dry stonework shall be filled with chinking stone of size as required to fill the voids.

6.4 FOUNDATION PREPARATION: Areas on which mortar setting bed is to be placed shall be trimmed and dressed to conform to cross section shown within an allowable tolerance of plus or minus 2 inches (5 cm.) from the theoretical slope, lines and grades. Where such areas are below the allowable minus tolerance limit, they shall be brought to grade by filling with earth similar to the adjacent material and well compacted. Immediately prior to placing the mortar setting bed, the prepared base will be inspected and no material shall be placed thereon until that area has been approved.

6.5 MORTAR EMBEDDED STONE (GROUTED STONE RIPRAP) shall be placed at locations indicated.

6.5.1 Mortar for Setting Bed and Joining Stone shall be composed of one part by volume of portland cement and four parts of sand. The cement and sand shall be as specified under SECTION: CONCRETE FOR STRUCTURES. Hydrated lime may be added to the mixture of sand and cement in an amount equal to 20 per cent of the volume of cement used. Hydrated lime shall conform to ASTM Specification C 141. The quantity of water in the mixture shall be sufficient to produce a stiff workable mortar, but shall in no case exceed 26 liters of water per 50 kilogram sack of cement. Water shall be clean and free of injurious acids, alkalies, and organic impurities. The mortar shall be used within 30 minutes from the time the ingredients are mixed with water.

6.5.2 Setting Bed shall be as hereinbefore specified. Unless otherwise directed only as large an area of setting bed shall be spread at one time as can be covered with stone before the mortar has obtained its initial set. Surplus mortar shall be removed, and the setting bed shall be spread, tamped to force out air pockets, and screeded to a true plane. The thickness of setting bed shall be not less than 3 inches (7.6 cm.).

6.5.3 Setting Stone: Stone shall be carefully placed by hand to the profile shown. The stone shall be placed in a single layer with the dimensions of the stone corresponding to the thickness of the stone protection laid normal to the plane of the slope. Double-decking of thin flat stone to obtain the required depth of stone protection will not be permitted. Adjacent stone shall be selected for size and shape. When ready for setting, stone shall be brushed free of dust and cleaned on a sides, by scrubbing, if necessary, with fiber brushes and clean water. Prior to setting, stone shall be wetted sufficiently to take up its surface absorption, but no stone having a film of water on its surface shall be set. The stone shall be laid on the freshly prepared setting bed while the surface is still plastic and the stone then tamped into the mortar to insure solid bedding to the exact slope or level of finished surface. The stone shall be roughly coursed with courses running horizontally and breaking joints with the preceding course as far as practicable. The joints shall have full mortar coverage. Joints shall be tooled slightly concave with a device of as long length as practicable and so that the mortar will be thoroughly compacted and pressed against the edges of the stone. Tooling shall not be done until after the mortar has taken its initial set. A tolerance of plus or minus 2 inches (5 cm.) from the slope lines and grades indicated will be allowed in the finished surface of the stone protection provided either extreme of this tolerance is not continuous over an area greater than 200 square feet (18 sq.m.). After completion of any strip, no workmen or any load shall be permitted on the finished surface of the stone work for a period of at least 24 hours. The finished stone work shall be protected from injury, and shall be cured by keeping the surface continuously wet for a period of not less than 7 days.

- End of Section -

SECTION 7 - CONCRETE FOR STRUCTURES

7.1 GENERAL REQUIREMENTS: The work includes the providing of concrete for structures in strict accordance with the applicable drawings and specifications, and subject to the terms and condition of the contract.

7.2 MATERIALS:

must have adequate protection from rain and have at least 20 cm. clearance under the storage floor for ventilation.

7.2.2 Aggregate, Coarse as delivered to the mixers shall consist of clean, hard, angular, unweathered and uncoated crushed rock or crushed stone or gravel. Where necessary, dust and other coatings shall be removed from aggregates by adequate washing. The aggregate obtained must be particles ranging in size from the largest 2.5 cm. to the smallest 3 mm.

7.2.3 Aggregate, Fine shall be clean sand, which has previously been passed through a sieve with 6 mm. mesh, and free from such impurities as earth lumps, vegetation and other organic matters. The purity of the sand shall be determined to be free from vegetation by a standard testing with 3 per cent Sodium Hydroxide solution.

7.2.4 Reinforcing Steel shall be plain, structural grade billet steel, free from rust and mill scale. Steel shall have a minimum tensile strength of 55,000 lbs. per sq.in. or 3,860 kg/sq.cm. and a minimum yield point of 33,000 pounds per sq.in. or 2,320 kg/sq.cm. Deformed bars of equal strength may be substitute for plain bars without reduction in bar area.

7.2.5 Water for washing aggregate and for mixing and curing concrete shall be clean, fresh, and free from injurious amounts of oil, acid, salt, alkali, organic matter, or other deleterious substances.

7.2.6 Curing Materials may be water proof paper, cotton mats, burlap, or other approved means.

7.2.7 Forms shall be of a good grade of lumber or plywood and shall be subject to approval.

7.3 FORM AND FALSEWORK: Forms shall be constructed to conform to shape, form, and line required, and shall be maintained sufficiently rigid to prevent deflection of form material and consequent waviness in surface of concrete.

7.3.1 Design: Joints shall be sufficiently tight to prevent leakage of grout during placing and shall be arranged vertically or horizontally to conform to the pattern of the design. Lumber once used in forms shall have nails withdrawn and surfaces to be exposed to concrete carefully cleaned before reuse. Forms shall be readily removable without hammering or prying against the concrete.

7.3.2 Form Ties shall be of suitable design and adequate strength for the purpose. Wire ties will not be permitted.

7.3.3 Coating: Forms for exposed surfaces shall be coated with colorless mineral oil before reinforcement is placed. Surplus oil on form surfaces and any oil or reinforcing steel shall be removed.

7.3.4 Removal: Forms shall be removed only after approval and in a manner to insure complete safety of the structure.

7.4 REINFORCING STEEL: Reinforcing steel fabricated to shapes and dimensions shown, shall be placed where indicated on drawings or where required to carry out the intent of the drawings and specifications. Before being placed, reinforcing steel shall be thoroughly cleaned of loose or flaky rust, mill scale, or coating, and of any other substance that would reduce or destroy the bond. Reinforcing steel reduced in section shall not be used. After any substantial delay in the work, previously placed reinforcing steel left for future bonding shall be inspected and cleaned. Reinforcing steel shall not be bent or straightened in a manner injurious to the steel. Bars with kinks or bends not shown on drawings shall not be placed. The use of heat to bend or straighten reinforcing steel will not be permitted.

7.5 STRENGTH REQUIREMENTS: Concrete required for the project shall be proportioned and mixed for a minimum ultimate compressive strength at 28 days of 3,000 pounds per sq.in. or 210 kilograms per sq.cm. using standard 6 inch diameter cylindrical specimens.

7.6 PROPORTIONING OF CONCRETE MIXES: Concrete shall be mixed by volume in the proportion of one part cement to 2.5 parts fine aggregate and 4 parts coarse aggregate.

7.6.1 Cement: A bag of portland cement will be considered as 50 kilograms in weight. The concrete as mixed shall contain not less than six (6) 50 kilograms bags or cement per cubic meter.

7.6.2 Cement-Water Ratio: The concrete shall contain not more than 29 liters of water per 50 kilogram bag of cement in the mixed concrete, unless otherwise directed in order to obtain the specified slump.

7.6.3 Concrete Strength and Proportioning is based on the assumption that saturated-surface dry aggregates are used, and/or that the amount of water specified includes the free water in the aggregate.

7.7 WORKABILITY: The consistency of the mixture shall be that required for the specific conditions and methods of placement. The slump shall fall within the following limits:

<u>Slump for Vibrated Concrete</u>	
<u>Minimum</u>	<u>Maximum</u>
5.0 cm.	10.0 cm.

7.8 BATCHING AND MIXING:

7.8.1 Concrete Mixing Equipment shall be power operated and in good mechanical condition. Hand mixing will not be permitted without written approval. Provision shall be made for introducing cement, aggregate and water into the mixer in the proper quantities.

7.8.2 Mixers shall not be charged in excess of rated capacity nor be operated in excess of rated speed. Excessive mixing, requiring addition of water to preserve required consistency, shall not be permitted. The entire batch shall be discharged before recharging.

7.8.3 Mixing Time shall be measured from the instant water is introduced into the drum containing all solids. All mixing water shall be introduced before one-fourth of the mixing time has elapsed. Mixing time for mixers of 3/4 cu.m. or less shall be 1 1/4 minutes; for mixers larger than 3/4 cu.m. mixing time shall be increased 15 seconds for each additional 1/2 cu.m. or fraction thereof.

7.9 EMBEDDED ITEMS: Before placing concrete, care shall be taken to determine that all embedded items are firmly and securely fastened in place as

indicated on the drawings or as directed. All embedded items shall be thoroughly cleaned and free from oil and other foreign matter such as loose coatings of rust, paint and scale.

7.10 PREPARATION FOR PLACING: Hardened concrete, debris and foreign materials shall be removed from interior of forms inner surfaces of mixer and conveying equipment. Reinforcement shall be secured in position, inspected and approved before pouring of concrete.

7.11 PLACING CONCRETE: Concrete shall be handled from mixer to place of final deposit in a continuous manner, as rapidly as practicable, and without segregation or loss of ingredients until the approved unit of operation is completed. Concrete that has attained its initial set or has contained its mixing water for more than 45 minutes shall not be placed in the work. Forms or reinforcement shall not be splashed with concrete in advance of pouring. Concrete shall not be placed on concrete sufficiently hard to cause formation and planes of weakness within the section.

7.11.1 Concrete shall not be placed except in the presence of the Contracting Officer, nor prior to his approval of forms and placement of reinforcing bars. In no case shall approval relieve the contractor of responsibility for the work.

7.12 COMPACTION:

7.12.1 Concrete shall be compacted by hand spading and rodding or by mechanical vibrators. Compaction shall continue until all voids are filled but care shall be taken to prevent segregation of materials.

7.12.2 Vibrators shall in no case be used to transport concrete inside forms. Use of form vibrators will not be permitted. Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the concrete.

7.13 FINISHES OF CONCRETE: Slight honey-comb and minor defects in all concrete surfaces shall be patched with cement mortar of one part cement and two parts sand. Trowel finish shall be obtained by tamping the concrete with special tools to force the coarse aggregate away from the surface, then screeding and floating with straight edges to bring the surface to the required finish level shown on the drawings. While the concrete is still green but sufficiently hardened to bear a man's weight without deep imprint, it shall be wood floated to a true even plane with no coarse aggregate visible. Sufficient pressure shall be used on the wood floats to bring moisture to the surface. The concrete shall then be hand-trowelled to produce a smooth impervious surface free from trowel marks. An additional trowelling shall be given the surface for the purpose of burnishing. The final trowelling shall produce a ringing sound from the trowel.

7.14 CURING: Curing shall be accomplished by preventing loss of moisture, rapid temperature change, and mechanical injury from rain or flowing water for a period of 7 days when normal portland cement has been used, or 3 days when high early strength portland cement has been used. Curing shall be started as soon after placing and finishing as free water has disappeared from the surface of the concrete.

7.14.1 Moist Curing: Unformed surfaces shall be covered with burlap, cotton, or other approved fabric mats, or with sand and shall be kept continually wet. Forms shall be kept continually wet and if removed before the end of the curing period, curing shall be continued as on unformed surfaces, using suitable material.

- End of Section -

SECTION 8 - MASONRY

8.1 GENERAL REQUIREMENTS: The work includes the providing of all brick masonry work, complete, in strict accordance with the applicable drawings and specifications and subject to the terms and conditions of the contract.

8.2 BRICK: Common brick shall be of the type and sizes conforming to local brick standards.

8.3 MORTAR shall be in the proportion of 1 part portland cement, 1 part hydrated lime and 4 1/2 parts sand mixed with sufficient water to make a mortar of such consistency that it can be handled easily with a trowel. Mixing shall be performed in mechanical mixers, unless hand-mixing and equipment used are approved by the Contracting Officer. The dry materials shall be thoroughly mixed before water is added. The mortar shall be used within 45 minutes after mixing or shall be discarded. Retempering of mortar will not be permitted.

8.4 LAYING OF UNITS: No brick having a film of water on its surface shall be laid. Bricks shall be wetted before laying. Each brick shall be laid in a full bed of mortar. Brick shall be laid plumb, true to line, with level courses, and with each course breaking joints with the course next below. Any brick that are disturbed after the mortar has stiffened shall be removed and relaid with fresh mortar. Mortar in the joints of the brick work shall be struck off flush.

- End of Section -

SECTION 9 - MISCELLANEOUS METAL WORK

9.1 GENERAL REQUIREMENTS: The work includes the providing of all miscellaneous metal work not elsewhere specified, complete.

9.2 MATERIALS:

9.2.1 Structural Steel: All structural steel shall be rolled shapes to conform to the requirements of ASTM A-7 with $f_y = 33,000$ psi. All bolts shall be A-307 steel with threaded parts of A-7 and A-373 steel.

9.2.2 Trench Cover Plate shall be galvanized steel checkered plate, thickness as indicated and fabricated as shown. Frame shall be galvanized steel angles with sizes indicated with bent anchor bars cast in place at the same time with the concrete.

- End of Section -

SECTION 10 - CARPENTRY

10.1 GENERAL REQUIREMENTS: The work includes the providing of all carpentry work, complete.

10.2 MATERIALS: Timber for this work shall be local timber of the species listed herein.

10.2.1 Grade and Quality of Lumber: All lumber shall have the following minimum allowable stresses:

Extreme fiber in bending "f" and tension	
parallel to grain	1,500 psi.
Horizontal shear "h"	120 psi.
Compression perpendicular to grain "cl"	390 psi.
Compression parallel to grain "c"	1,200 psi.
Modulus of elasticity "e"	1,760,000 psi.

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Wood shall be clear and free from knots, checks, shakes and splits. Cross grain at the joint shall not exceed a slope of 1 in 10.

10.2.3 Moisture Content: The timbers shall be seasoned to a moisture content corresponding as nearly as practicable to that which they will attain in service but not to exceed 20 per cent.

10.3 MACHINE BOLTS, NUTS AND SAG RODS shall be of steel having a yield point of not less than 33,000 psi (2,300 kg/cm²). Unless otherwise shown, bolts and nuts, shall be unfinished type with square heads for bolts and square nuts. Threads shall be in accordance with the American Standard Unified Coarse thread series.

10.4 WASHERS each bolt and nut shall be provided with a steel washer. Unless otherwise shown, washers shall be square, unfinished type. Inner hole shall closely fit the bolt and clear the threaded portion easily. Washer sizes shall be as follows:

<u>Bolt Size</u>	<u>Washer Size</u>	<u>Center Hole</u>
3/8" Ø	1 1/2" by 1 1/2" by 3/16" thick	7/16
1/2" Ø	2" by 2" by 1/4"	9/16
5/8" Ø	2 1/2" by 2 1/2" by 3/8"	11/16
3/4" Ø	3" by 3" by 3/8"	13/16

10.5 INTERIOR CARPENTRY:

10.5.1 Asbestos Cement Boards shall be pre-drilled for fasteners, holes spaced at 10 inches on centers 3/8-inch from edges and along all bearings. Fasteners may be nails or screws. Nails shall have flat heads and of size and length as will penetrate the bearings not less than 3/4 inch. Screws shall have flat countersunk heads, and shall be No. 9 A.W.G. 3/4 inch long.

10.6 FLUSH TYPE (Hollow Core): Doors shall have hollow cores of such type as will adequately support the outer plywood and afford strength and stability for the use intended. Doors shall be provided with a lock of sufficient size for the proper installation of intended finish hardware. Veneers for cross bonding and face shall be at least 2 or more piles with a combined minimum thickness of 5/16 inch before sanding. Face veneer shall be approved hardwood. Edge strips shall be tongued and grooved into stiles and rails and properly glued and nailed. All veneers shall be bonded with a water-resistant type adhesive applied to all contact surfaces, and the whole door shall be placed in a gluing press and uniformly pressed.

- End of Section -

SECTION 11 - SHEET METAL WORK

11.1 GENERAL REQUIREMENTS: The work includes the providing of all sheet metal, complete.

11.2 MATERIALS:

11.2.1 Galvanized Iron and Steel shall be copper-bearing. Sheet metal work shall be of gauge indicated or specified.

11.3 INSTALLATION:

11.3.1 General: Surface to which sheet metal is to be applied shall be even, smooth, sound, thoroughly clean and dry, and free from all defects that might affect the application. All accessories or other items essential to complete sheet-metal and miscellaneous metal installation, though not specifically shown or specified shall be provided. Standard commercial products which meet the general requirements of the drawings and specifications will be acceptable. Welding shall be continuous along entire line of contact except where tack welding is authorized. Tack welding will not be permitted on exposed surfaces. Exposed welds shall be ground smooth. Steel shall be clean and free from mil-scale, flake rust or pittings. Nails, brads, clips, and so forth for ferrous metal shall be galvanized iron or steel. All items shall be installed plumb, straight, square, level, at their proper elevation and location, and in proper alignment with adjacent work.

11.3.2 Soldering: All edges of uncoated sheet metal to be soldered shall be pre-tinned before soldering is begun. Soldering shall be done slowly with well-heated irons so as to heat the seam thoroughly and sweat the solder completely through the full width of the seam. Ample solder shall be used and the seam shall show not less than one full inch of evenly flowed solder. Soldering shall follow immediately after application of flux. Upon completion of soldering, acid shall be neutralized and surfaces shall be cleaned thoroughly.

11.3.3 Seams: Flat lock seams shall be finished not less than 19 millimeters wide, soldered lap seams not less than 25.4 millimeter wide and unsoldered lap seams not less than 101.6 millimeter wide.

11.5 DOWNSPOUTS shall be constructed of 24-gauge galvanized steel sheet, size as indicated, and shall be provided in sections approximately 3.00 meters long with flat-lock seams. Downspouts shall be set plumb and clear of wall and shall be firmly secured to the supporting construction by 5-centimeter wide, 24-gauge galvanized steel straps attached to the downspout. Two straps shall be provided for each section of downspout, located near the top and bottom.

- End of Section -

SECTION 12 - ROOFING; ASBESTOS CEMENT

12.1 GENERAL REQUIREMENTS: The work includes providing all asbestos cement roofing, roofing accessories, caulking and fastenings, complete.

12.2 MATERIALS:

12.2.1 Asbestos Cement Sheets: All sheets shall be new standard sizes as manufactured locally, without holes, cracks or other defects. Sheets shall be dense, tough, completely cured, and manufactured with the weather side relatively smooth.

12.3 ACCESSORIES: Ridge pieces, valleys, apron flanges, eave ridges, and all other required accessories shall be of the same material and section as the roofing sheets, manufactured by the same manufacturer, and installed in such a manner as to insure weatherproof and watertight intersections and joints. Where such accessories are manufactured for an express purpose, no substitution will be allowed in metal, wood, concrete or plaster.

12.4 FASTENERS FOR WOOD PURLINS shall be galvanized metal and furnished by the manufacturer of the roofing material. End clips shall be sized to the thickness of the roofing material used. Coach screws and hook bolts for accessories shall be equipped with neoprene, lead or other approved waterproof gasket to provide a watertight joint.

12.5 INSTALLATION:

12.5.1 General: All sheets, fasteners, and accessories shall be installed in strict accordance with the manufacturers recommendations. Sheets shall be laid with the corrugations parallel with the roof slope, and starting at the end of the building opposite the prevailing wind. End laps shall be not less than 8-inch (20 cm.) and side laps shall be not less than one corrugation. All gable and eave sheets shall be securely fastened to the fascia board or terminal purlin with coach screws at every high point of each corrugation. All intermediate sheets shall be secured with end clips at the low point of each low corrugation or with coach screws at every alternate high corrugation.

12.5.2 Fasteners for Wood Purlins: End clips for wood purlins shall be attached with 2-8 penny nails. Coach screws shall be started in pre-drilled holes and tightened to a firm and waterproof seat. Asbestos cement panels cracked, crazed or split as a result of over-tightening the fastenings, must be removed, discarded and replaced.

12.5.3 Closures: All ridge rolls shall be equipped with end pieces as manufactured by the roofing manufacturer. Where required, all terminal ends shall be closed with apron flanges, eave ridges, or eave blocks. Penetrations through roof shall be accomplished with soaker flanges or as detailed on the drawings. The use of metal, wood, concrete, or plaster as a substitute for manufactured accessories will not be accepted.

12.5.4 Caulking: Meetings of roofing sheets with accessories, and side and end laps of all sheeting shall be caulked with a 1/2 inch (12.5 mm.) round bead of caulking compound at the center of the overlap. Where installation is found to have been made without caulking, all material shall be removed and reinstalled in conformance with this section.

12.6 ACCEPTANCE: Any defective material or workmanship, or material installed but subsequently damaged during the course of the roof installation shall be removed, discarded, and replaced by the contractor.

- End of Section -

SECTION 13 - CAULKING

13.1 GENERAL REQUIREMENTS: The work includes providing of caulking, as shown, complete. Caulking shall be provided in all open joints exposed to the weather, at interior joints around metal and wood frames, as indicated or specified; and in all areas normally requiring sealing with caulking material, to provide water and weathertight construction.

13.2 MATERIALS shall be delivered to the job in the manufacturers' original unopened containers, with the brands, date of manufacture, and name clearly marked thereon. All materials shall be carefully handled and stored to prevent inclusion of foreign materials, or subjection to sustained temperatures exceeding 90 degrees F (30° C). Caulking compound shall be compatible with the material to, and against, which it is applied, and shall be of the non-staining type. Caulking compound more than six months old shall not be used. Color of caulking compound shall be gray, unless otherwise directed. All materials shall be as approved by the Contracting Officer.

13.3 SAMPLES: Before caulking work is started, a sample opening of each type of joint shall be caulked where directed. The sample shall show the workmanship, bond and color of caulking material, as specified or selected for the work. The workmanship, bond, and color of the caulking work throughout the project shall match that of the approved sample joint.

13.4 SURFACE PREPARATION: Surfaces against which primer and caulking are to be applied shall be clean, dry to the touch, free from grease, oil, wax, lacquer, paint, or other foreign matter that would tend to destroy or impair adhesion. All joints shall be enclosed on three sides. When grooves for adequate caulking have not been provided, suitable grooves shall be cleaned out to a maximum depth of 3/4 inch (19 mm.) for conventional type compound and to a maximum depth of 1/2 inch (12 mm.) for polysulfide type compound, and ground to a minimum width of 1/4 inch (6 mm.) without damage to the adjoining work. Where necessary to provide a suitable backstop, the backs of joints over 3/4 inch (19 mm.) in depth for conventional type or 1/2 inch (12 mm.) in depth for polysulfide type shall be filled and packed tightly with an approved backstop material to within the depths specified for the caulking compounds. All loose particles of mortar shall be cleaned out just prior to caulking and grooves given a uniform coating of primer. Primer shall not be applied to exposed finish surfaces.

13.5 APPLICATION: The caulking compound shall be applied in accordance with the manufacturer's printed instructions; using a gun with nozzle of proper size

to fit the joint width. The compound shall be forced into grooves with sufficient pressure to fill the grooves solidly. Caulking shall be uniformly smooth and free of wrinkles, and unless indicated otherwise, shall be tooled as necessary and left sufficiently convex to result in a flush joint when dry. Where the use of gun is impracticable, suitable hand tools may be used. The two component caulking compounds shall not be used when it becomes too gelled to be discharged in a continuous flow from the gun. Modification of the caulking compound by addition of liquids, solvents, or powders shall not be permitted. Only the amount of caulking which can be installed within four hours shall be mixed, but at no time, shall this amount exceed 5 gallon unit increments. Caulking around openings shall include the entire perimeter of each opening.

13.6 PROTECTION AND CLEANING: Areas adjacent to joints to be filled shall be protected from smearing by the compound. Paper masking tape may be used for this purpose if removed 5 to 10 minutes after the joint section is filled. Fresh compound that has accidentally been smeared on the masonry should be scraped off immediately and rubbed clean with methyl ethyl ketone, toluene or a similar solvent. Upon completion of caulking all remaining smears, stains, and other soiling resulting therefrom shall be removed and work left in a clean and neat condition.

- End of Section -

SECTION 14 - HARDWARE: BUILDERS

14.1 SCOPE: Furnish and install all builders locks, lock trim, door trim, hinges and miscellaneous builders hardware, complete.

14.2 MATERIAL AND FINISHES: Bright bronze or bright brass shall be used.

14.3 SAMPLES: A sample of each different item of finish hardware, properly tagged and marked for identification, shall be submitted to the Contracting Officer for approval.

14.4 KEYS AND KEYING: All locks shall have two keys with the lock number stamped upon them with the corresponding number stamped upon the face of the lock. Locks shall be masterkeyed as directed by the Contracting Officer. Three (3) master keys shall be furnished for each master key system.

14.5 HARDWARE TYPES:

14.5.1 Hinges:

14.5.1.1 Butt Hinges for Metal Doors shall be half-mortise, regular weight, wrought bronze, five knuckles and two ball bearings, stainless steel pins, button tips with non-rising loose pins. Loose pin hinges for exterior doors opening out shall be constructed that the pins cannot be removed when doors are closed. Each single door and each leaf of double doors shall be provided with three 5-inch by 5-inch butt hinges unless specified otherwise.

14.5.1.2 Interior Doors: Interior doors shall have three full mortise brass butt hinges size 5 inches by 5 inches unless specified otherwise. Doors with closers will have ball bearing type hinges.

14.5.2 Lockset and Latchsets:

14.5.2.1 Type 161A-4: One cylinder and turn button. Latch bolt from either side by knob, except when outside knob is locked by turn button in inside knob. Lock may be operated by key or inside knob when outside knob is locked. Latch bolt is automatically deadlocked against and pressure when door is closed. Turn button must be manually operated to release outside knob.

14.5.2.2 Type 161D-4: One cylinder. Latch bolt by key from outside and knob inside. Outside knob always locked. Latch bolt is automatically deadlocked against end pressure when door is closed.

14.5.3 Door Stops shall be cast bronze heavy weight rubber tip with hook and keeper. Projection shall be 3 1/2 inches. Diameter of base shall be approximately 2 1/4 inches.

14.6 APPLICATION OF HARDWARE:

14.6.1 Hinges: Top hinge shall be installed 5 inches from head rabbet to top edge of barrel, bottom hinge 10 inches from bottom edge of barrel to finished floor. For doors with three 3 hinges, the third hinge shall be centered between top and bottom hinges.

14.6.2 Locks and Latch Strikes: Locks and latch strikes shall be installed on doors and door frames with the center of door knobs 38 inches above the finish floor and centered not less than 8.3 centimeters from edge of door.

HARDWARE SETS:

Exterior hinged doors	1 1/2"	Pair butt hinges
	1	Door stop and hook
	1	Lockset 161D-4
Interior hinged doors	1 1/2"	Pair butt hinges
	1	Door stop
	1	Lockset 161A-4

- End of Section -

SECTION 15 - PLASTERING

15.1 GENERAL REQUIREMENTS: The work includes the providing of all plaster work, complete, in strict accordance with the specifications and applicable drawings, and subject to the terms and conditions of the contract.

15.2 MATERIALS:

15.2.1 Cement shall be portland cement conforming to the applicable requirements of cement in the section entitled CONCRETE FOR STRUCTURES.

15.2.2 Fine Aggregate shall be clean, hard and durable and free from oil, organic matter and other deleterious substances.

15.2.3 Lime: Lime shall be hydrated lime suitable for plastering. The total un-hydrated calcium oxide (CaO) and magnesium oxide (MgO) in the hydrated product shall not exceed 8 per cent by weight, calculated on the as-received basis.

15.2.4 Water: Water for mixing shall be clean, fresh and free from any deleterious substances such as oil, acid, alkali or vegetable matter.

15.3 Protection: Woodwork, glass, floors and other finishes shall be carefully protected from damage and from plaster droppings; all damaged areas shall be repaired and necessary patching shall be done by the contractor.

15.4 PREPARATION: Surfaces to receive plaster shall be clean and free from defects, oil, grease, acids, organic and other injurious matter. Masonry or concrete surfaces to receive plaster shall be damp when the plaster is applied. Where plaster terminates against wood such as windows or door bucks the contractor shall provide a wood stop before application, unless otherwise shown.

15.5 PROPORTIONING: Portland cement plaster shall be proportioned by volume as follows:

1 part portland cement
3 parts sand
1/10 part hydrated lime

15.6 MIXING: Select for mixing aggregates of uniform moisture content to avoid bulking. Mix materials to a uniform color before water is added; then wet-mix them to the desired consistency.

15.7 APPLICATION:

15.7.1 Finish Coat: The finish coat shall be about 0.6 cm. thick. Where cement plaster with a smooth troweled finish is specified or indicated on the drawings, the finish coat shall be first floated to a true and even surface, then troweled in a manner that will force the sand particles down into the plaster and, with the final trowelling, leave the surface burnished smooth and free from rough areas, trowel marks, checks, or other blemishes. Cement plaster in all other space, where a smooth finish is not specified or noted on the drawings, shall be given a sand float finish of a uniform texture, as approved. The finish coat shall be kept moist for at least 2 days, and thereafter shall be protected against rapid drying until properly and thoroughly cured.

15.7.2 Patching: Plaster containing cracks, blisters, pits or checks, will not be acceptable. Such plaster shall be removed and replaced. Patching of defective work will be permitted only when approved and such patch work shall match existing work.

15.8 CLEAN-UP: Upon completion of the plaster work, all debris arising from the work shall be removed and all surfaces defaced during the progress of the work shall be cleaned and restored as required.

- End of Section -

SECTION 16 - FIELD PAINTING

16.1 GENERAL REQUIREMENTS: The work includes the providing of all painting work, complete.

16.2 MATERIALS:

16.2.1 Paint shall be of color and manufacture selected by the Contracting Officer. The manufacturer shall be one of the following trade name; Sherwin Williams, Dutch Boy or General Paint.

16.2.2 Thinners shall be manufacturer's recommended thinner for the paint in question.

16.3 WORKMANSHIP: All painting shall be first class with materials applied evenly and smoothly without runs or sags. Any surfaces not properly covered and finished shall be further treated with paint as directed without additional cost. No painting shall be done in rainy weather, on either wet or damp surfaces, nor until preceding coat has thoroughly dried. To ensure a smooth finish all rough spots on surfaces between coats shall be sanded lightly. No spraying of paint will be allowed. Prime and second coats shall be thinned to approved consistency. Final coat paint for each and every portion of the work shall be undiluted factory prepared, except where authorized otherwise, and shall match approved samples.

16.4 SAMPLES: The Contractor shall submit samples of each different color paint finish used on the project. Such samples shall be on three by six inch panels of similar material as the surface to be painted and shall be painted in a similar manner to the painting of the surface as specified. Two samples of each finish will be supplied to the Contracting Officer for his approval. After approval of the finish, one sample will be returned to the Contractor and one retained by the Contracting Officer for comparison. No paint or finish shall be applied until the sample has been approved.

16.5 PREPARATION OF SURFACES: All dirt, dust, rust, loose particles, disintegrated paint, grease, and foreign matter shall be removed from all surfaces which are to receive paint or other finish. All nail holes, open cracks, joints, etc. in finished work shall be neatly puttied with a mixture consisting of 80 per cent putty mixed with 20 per cent of white lead, after first coat has been applied to the surfaces. On natural finish work, putty shall be colored to match the wood and shall be applied after the first coat of stain, and all adhered putty completely removed.

16.6 APPLICATION: Paint shall be applied carefully with good clean brushes. Sufficient time shall be allowed between coats to permit thorough drying. Finish coats shall be smooth and free from runs, sag or other defects. Each coat of paint shall be sufficiently heavy to cover completely the previous coat or surfaces.

16.7 PAINTING SCHEDULE:

16.7.1 Concrete and Plastered Masonry Surfaces shall be allowed to dry out and then be cleaned prior to painting. Such surfaces shall be given one coat of approved primer and two coats of emulsion paint.

16.7.2 Natural Finished Wood Surfaces shall be cleaned and given two coats of wax and polished until the surface meets the approval of the Contracting Officer. Such polishing may be by either machine or hand polishing.

16.7.3 Metal Surfaces shall be primed with two coats of zinc-chromate, each coat applied to minimum film thickness of 1 mil, and two finished coats of titanium zinc and oil paint, each coat applied to a minimum film thickness of 1.5 mils.

- End of Section -

SECTION 17 - FUEL TANKS AND PIPING

17.1 GENERAL REQUIREMENTS: This section includes providing tanks and piping for diesel fuel, complete.

17.2 MATERIALS AND EQUIPMENT shall conform to the respective requirements specified below. Other materials and equipment shall be as specified elsewhere herein and as shown on the drawings, and shall be the products of manufacturers regularly engaged in the manufacture of such products. Materials and equipment shall essentially duplicate items that have been in satisfactory use at least two years prior to bid opening. Only new materials shall be used. All materials shall be resistant to the effects of diesel fuel.

17.2.1 Couplings used for pipe connections to the tanks shall conform to API Specification 5L and shall be seamless, extra heavy, of wrought steel, and with recessed ends.

17.2.2 Flange Gaskets shall be fabricated from a homogeneous synthetic-rubber-base and/or resin-base material. Gasket stock shall be approximately 3/32 inch (2.38 mm.) thick in its free state and 1/16 inch (1.58 mm.) thick after compression in a flanged joint.

17.2.3 Bolts and Nuts: Bolts shall be steel and shall be semi-finished, hexagonal heads, Class 2 fit. Nuts shall be Class 0, Class 2 fit, and shall be semi-finished, heavy hexagonal. All bolts and nuts shall be galvanized after fabrication.

17.2.4 Joint Compound shall be suitable for use with fuel containing 40 per cent aromatics and shall be resistant to water.

17.2.5 Pipe, Steel: Steel pipe schedules specified herein shall be, schedule 40, or standard weight, black, threaded and coupled ends. Pipe for fuel systems shall be manufactured by seamless electric-resistance-welded processes. All pipe shall be of a grade and quality that will withstand bending or colling. Extra heavy, recessed end couplings shall be furnished with threaded pipe.

17.2.5.1 Welding procedures including qualification of welders shall conform to the applicable paragraphs of API Standard 1104 Latest Issue Standard for Welding Pipelines and Related Facilities.

17.2.5.2 Pipe Valves and Fittings:

17.2.5.2.1 Screwed Fittings shall be wide-banded 150-pound malleable-iron, screwed and black.

17.2.5.2.2 Nipples: Steel pipe nipples shall be of the same material as the pipes.

17.2.5.2.3 Unions: Steel pipe unions shall be steel, black, steel to steel seats with ground joints.

17.2.5.2.4 Valves shall be designed for 150-pound primary service-pressure ratings. Gate valves shall be bronze body and trim, union bonnet, for screwed connections. Check valves shall be bronze body, synthetic-rubber disk type, swing check, for horizontal mounting, 150-pound.

17.2.6 Steel Plate for storage tanks shall be open-hearth, and shall conform to ASTM Specification A283, Grade C.

17.3 PIPING shall be steel and all materials used shall be new and unused unless otherwise approved. The full length of each section of underground pipe shall rest solidly on the pipe bed. Any pipe with its grade or joint disturbed after laying shall be taken up and relaid. Piping connections to equipment shall be in accordance with the details indicated or as directed. The interior of the pipe shall be thoroughly cleaned of all foreign matter before being lowered into the trench and shall be kept clean during laying operations by means of plugs or other approved methods. The pipe shall not be laid in water or when the trench or weather conditions are unsuitable for such work. When work is not in progress, open ends of pipe and fittings shall be securely closed so that no trench water, earth, or other substances can enter the pipe or fittings. Any pipe, pipe fittings, or appurtenances found defective after installation shall be replaced without additional cost to the Government.

17.3.1 Screwed Joints shall be made with tapered threads conforming to the NBS Handbook H28, and shall be made perfectly tight with joint compound applied to the male threads only.

17.3.2 Cutting Pipe, where necessary, shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise authorized, cutting shall be done by means of an approved type of mechanical cutter. Wheel cutters shall be used when practicable. Pipe shall be reamed to true internal diameter after cutting, to remove burs.

17.3.3 Installing Pipe: In shipping, delivering, and installing, pipe and accessories shall be handled in such manner as to insure a sound, undamaged condition. Particular care shall be taken not to injure pipe coating when lowering pipe into trench and when backfilling.

17.3.3.1 Laying Underground Pipe: Underground pipelines shall be laid with a minimum pitch of 1 inch per 50 feet (2.5 cm. per 15 meters). The underground pipe shall have the minimum cover as shown and shall be embedded as specified in SECTION: EARTHWORK AND STORM DRAINAGE.

17.3.4 Pneumatic Testing: Piping to be installed underground shall not receive field-applied protective covering or be covered by backfill until the piping has successfully passed the pneumatic test for leaks described herein. Piping specified herein shall be tested under a pneumatic pressure of 90 pounds per square inch (6.3 kg. per sq.cm.) for at least 2 hours during which time there shall be no drop in pressure in the line, allowances being made for thermal expansion and contraction. To facilitate this test, the Contractor may isolate various sections of the piping system and test each one separately. Where such sections terminate at valve points, the line shall be closed by means of caps in lieu of relying on the valve. The Contractor shall furnish tapped flanges than can be attached to the end of the section of line being tested, and that will permit a direct connection for the piping from the air compressor. No taps in the line will be permitted. The Contractor shall furnish necessary equipment for testing; and gauges shall be subject to testing and approval. In the event leaks are detected, the line shall be repaired and the test repeated. On completion of satisfactory tests, the pressure shall be relieved and the line immediately sealed. Suitable provision shall be made to prevent displacement of the piping during testing.

17.3.5 Cleaning Before Applying Protective Covering or Coating: After piping has passed the pneumatic pressure testing for tightness, the exterior surface of the piping shall be thoroughly cleaned of foreign matter by wire brushing and solvent cleaning.

17.3.6 Protective Covering or Coating for Underground Pipe and Fittings: Immediately after cleaning, the piping shall be protected as follows:

17.3.6.1 Protective Covering for Underground Piping: Primer and tape shall be used for underground pipe protective covering. The pipe shall be primed and immediately wrapped with the tape applied with a 50 per cent overlap as recommended by the tape manufacturer. Joints and fittings shall be covered with the same primer and tape, or with the coating described hereinafter, or shall be primed and hand-wrapped with primer and hot-applied preformed coal tar tape.

17.4 STORAGE TANK shall be nonpressure type, horizontal, welded steel tank suitable for aboveground installation. Tank shall have a capacity as indicated on the drawings. No internal bracing shall be used. Openings shall be provided and attachments welded as indicated. Tanks shall be shop tested and proved tight against leakage under a test using air at a gauge pressure of 5 pounds per square inch (0.35 kg. per sq. cm.). Shop testing shall be performed after the various openings are installed. After the tank has been installed and all connections made, the tank and fittings shall again be tested against leakage, at 5 pounds per square inch (0.35 kg. per sq. cm.) air pressure. Leaks disclosed by tests shall be repaired, and the tank shall be retested.

17.4.1 Coal Tar Primer and enamel shall be applied to clean exterior surfaces. After the primer has dried thoroughly, and within the time specified by the manufacturer, the enamel shall be hot applied. A copy of the manufacturer's application instructions shall be furnished to the Contracting Officer. The work shall be done by personnel specifically experienced in the hot application of coal tar enamel and (except as may be otherwise specified herein) in strict accordance with the manufacturer's instruction. The thickness of the dry coating system will not be less than 1/16 inch (1.6 mm.) at any point.

17.4.2 Tank Installation (Aboveground): The tank shall be provided with supports as shown. Concrete supports shall conform to the applicable requirements of SECTION: CONCRETE FOR STRUCTURES. One-inch filler strips conforming to ASTM Specification D 1751 or ASTM Specification D 1752 shall be used between the tank shell and concrete saddle. Tank straps, when required, shall be provided and installed as shown.

17.4.3 Tank Calibration: The Contractor shall provide a calibrated chart showing the liquid contents of the tank per inch and per centimeter of depth. Two reproductions of the gauge chart shall be inclosed in plastic envelopes and bound in stiff-back binders. The Contractor shall provide a gauge stick graduated in feet, inches, and eights of an inch, and in meters, centimeters, and millimeters. Gauge sticks shall be of wood and properly treated after graduating to prevent swelling or damage from the fuel.

17.4.4 Tank Grounding shall be as shown.

17.5 TANK EQUIPMENT: Steel access ladder, fill connection, sounding, supply, gauge glass, manhole and drain shall be of sizes as shown shall be provided for each tank.

17.6 DIKE: The dike around the diesel fuel storage tanks shall be constructed as shown complete with sump drain and drain piping. Concrete work shall conform to SECTION: CONCRETE FOR STRUCTURES. Dike shall be constructed and shall conform to SECTION: RESERVOIR (FUEL STORAGE TANKS). Drain pipe shall be galvanized steel pipe with 125 pounds cast-iron, bronze trim gate valve with suitable means of locking in the closed position. Drain pipe shall be caulked tight to the wall of sump to prevent leakage.

17.7 DIESEL FUEL FILTERS shall consist of two 5-gpm capacity filters complete with piping as shown. Filters shall have steel construction with interior surfaces vinyl coated to resist corrosion. Units shall be designed to filter dirt and separate water. The units shall be complete with gauge glass, drain valve and filter cartridge. The units shall be supplied with 12 each spare cartridges for replacements. The unit shall be Model BFS-5-VI Single Pass Dirt Filter - Water Separator Bowser Briggs Filtration Division Cookeville, Tennessee or approved equal.

17.8 CLEANING INTERIOR SURFACE OF TANKS: The interior of tanks that are accessible shall be clean and free from all foreign matter, such as dirt, debris, grease, and oils, that might later interfere with the operation of the system or that might be a source of contamination of the product to be stored in the tank. The cleaning shall be done to the satisfaction of the Contracting Officer.

17.9 FLUSHING AND TESTING: After various components of the system have been properly adjusted by the Contractor, the Contractor shall demonstrate to the satisfaction of the Contracting Officer that the system meets the performance requirements for which it was designed. In the event any portion of the system or any piece of equipment fails to meet the various tests, the Contractor shall make the necessary repairs or adjustments and the test shall be repeated until satisfactory performance is obtained. All tests shall be witnessed by the Contracting Officer. All instruments and equipment required to properly conduct the tests shall be furnished by the Contractor.

17.10 SUBSTITUTIONS: If any substitutions of materials or equipment specified and/or shown are deemed necessary by the Contractor, comparative details of such substitution shall be submitted as soon as practicable, and within 30 days after award of the contract, to the Contracting Officer for approval. In addition, the Contractor shall furnish proof, satisfactory to the Contracting Officer that items identical to those proposed as substitutions are in current use and performing satisfactorily in similar installations. No such substitutions shall be made without the prior and specific written approval of the Contracting Officer.

- End of Section -

SECTION 18 - DIESEL ELECTRIC GENERATING SET AND AUXILIARIES

18.1 GENERAL REQUIREMENTS: The work includes the providing of one diesel electric generating set and auxiliaries, complete.

18.2 DIESEL ELECTRIC GENERATING SET shall be packaged type, 250 kw, 220/380 V, 3 phase, 4 wire, 50 cycle, 1,000 rpm, radiator cooled, unhusd for continuous duty. The unit shall be complete in all respects for connecting power and fuel lines in the field and shall be supplied complete with other auxiliaries as specified.

18.2.1 Diesel Engine shall be full compression ignition, four stroke cycle, single-acting, solid-injection and shall be vertical with trunk type pistons.

18.2.1.1 Governor: The governor shall be capable of maintaining accurate engine speed control within 2% of rated speed for any load from open circuit to full rated load.

18.2.1.2 Fuel System: The engine shall be capable of satisfactory performance on a commercial grade of distilled petroleum fuel oil such as No. 2 domestic burner oil. The engine shall be capable of operating at light loads for extended periods of time and shall provide for precombustion of the fuel or a similar means for the prevention of carbonization. The engine shall have an individual mechanical injection pump and injection valve for each cylinder. Fuel injection pumps shall be positive action, constant-stroke pumps, actuated by a cam driven by gears from the engine camshaft. Fuel lines between injection pumps and valves shall be of heavy seamless tubing, and to eliminate irregularity of fuel injections, shall be of the same length for all cylinders. The fuel system shall be equipped with a fuel filter having replaceable elements which may be easily removed from their housing for replacing without breaking any fuel line connections, or disturbing the fuel pumps or any other part of the engine. All fuel filters shall be conveniently located in one accessible housing, ahead of the injection pumps so that the fuel will have been thoroughly filtered before it reaches the pumps. No screens or filters requiring cleaning or replacement shall be used in the injection pump or injection valve assemblies. The engine shall be equipped with a built-in gear-type, engine-driven fuel transfer pump, capable of lifting fuel against a head of twelve feet, for supplying fuel through the filters to the injection pump at constant pressure. Flexible hose fuel lines shall also be supplied with the generator set.

18.2.1.3 Cylinder Liners: The engine shall be provided with removable wet-type cylinder liners, of close-grained alloy iron, heat treated for proper hardness to obtain maximum life.

18.2.1.4 Lubrication System: The engine shall have a gear-type lubricating oil pump for supplying oil under pressure to main bearings, crank pin bearings, pistons, piston pins, timing gears, camshaft bearings, and valve rocker mechanism. Effective lubricating oil filters shall be provided and so located and connected that lubricating oil is continuously filtered and cleaned. Filters shall be accessible, easily removed and cleaned, and shall be equipped with a spring-loaded by-pass valve as an insurance against stoppage of lubricating oil circulation in event the filters become clogged. The engine shall have a suitable water-cooled lubrication oil cooler.

18.2.1.5 Air Cleaners: The engine shall be provided with one or more oil bath or dry type air cleaners of sufficient capacity to protect effectively the working parts of the engine from dust and grit.

18.2.1.6 Starting System: The engine shall be equipped with an electric starting system of sufficient capacity to crank the engine at a speed which will allow for full diesel start of the engine. The starting pinion shall be so arranged as to disengage automatically when the diesel engine starts. A storage battery shall be furnished having sufficient capacity for cranking the engine for at least 30 seconds at firing speed in the ambient temperature of 90 degrees F (30°C) and with capacity for starting the diesel engine a minimum of three times, using appropriate starting aids as recommended by the engine manufacturer. A suitable battery charging device shall be provided with sufficient capacity for normal starting requirements of four starts per day, and shall include an engine mounted battery charge rate ammeter.

18.2.1.7 Cooling System: The engine shall be furnished with a cooling system having sufficient capacity for cooling the engine when the diesel electric set is delivering full-rated load in an ambient temperature not to exceed 115°F. The engine shall be provided with a thermostatic valve placed in the jacket water outlet, between the engine and the cooling source. This valve shall maintain the jacket water temperature as recommended by the engine manufacturer, under all load conditions. The engine shall be equipped with an engine driven, centrifugal-type water circulating pump for circulating water through the engine jacket, cylinder heads, lube oil cooler, and radiator. The engine shall be equipped with a radiator and fan of a type and capacity recommended by the engine manufacturer.

18.2.1.8 Exhaust System: A suitable Maxim silencer, or equal, of the residential type shall be furnished with the engine. A flexible exhaust adapter at least 16 inches long shall be furnished for each exhaust outlet to the muffler.

18.3 SAFETY CONTROLS: The engine shall be equipped with automatic safety controls which actuate an audible alarm and will shut down the engine in the event of low lubricating oil pressure or high jacket water temperature.

18.4 MOUNTING: The engine and generator shall be equipped with skid base for mounting the engine-generator unit on a concrete foundation. Suitable rubber or spring type vibration isolators if required shall be provided between the engine-generator and its concrete foundation.

18.5 ELECTRICAL REQUIREMENTS:

18.5.1 Generator: The generator shall be 220/380 volts, 3 phase, 4 wire, 50 cycle, 1,000 rpm, rated 250 kw at 0.8 power factor, and shall be heavy duty, ball bearing, vertical drip-proof construction. Cross current compensation circuits shall be provided to limit armature cross current between unit and existing units when operating parallel. All electrical devices shall be factory wired with wires terminated in a control junction box.

18.5.2 Generator Coupling: The generator shaft shall be connected to the engine flywheel through a suitable flexible coupling.

18.5.3 Exciter: The exciter shall be brushless type and shall have sufficient capacity to produce ample excitation to the generator under all normal load conditions. The exciter may be belt driven or direct-connected. A static excited, magnetic amplifier controlled type machine will be acceptable.

18.5.4 Switchboard: The switchboard shall be of the floor-standing type of substantial steel construction with full length hinged front door. Size shall not exceed 24" W. x 24" D. x 6'6" H. The switchboard shall contain all equipment controls and devices required proper operation of generator unit in accordance with these specifications. The instruments and controls mounted on the switchboard shall include, but not be limited to:

Wattmeter
Generator AC Voltmeter
Bus AC Voltmeter
AC Ammeter
Switch, Ammeter Phase
Selector
Voltage Adjust Switch
Panel Lights and Switch

Reverse Power Relay
Main Generator Circuit
Breaker
Paralleling Lights with
Switch Running Time Meter
Necessary Transformers,
Fuses, etc.

18.6 TESTS:

18.6.1 General: After the diesel generator sets installation is completed, and at such time as the Contracting Officer may direct, the contractor shall conduct an operating test for approval. Engines shall be run continuously through the consecutive tests, to demonstrate engine performance within normal operating limits of engine temperatures and operating pressure in accordance with published Instruction Manual data of the manufacturer, a copy of which will be furnished the Contracting Officer by Contractor. The Contractor shall furnish all labor and water rheostat or other artificial electrical load, except that electrical load which is already installed may be connected if considered suitable for test use by the Contracting Officer. Fuel, oil and water will be furnished by the Government. Starting time shall be approved by the Contracting Officer. Instrument readings shall be recorded at 60 minute periods for the following items.

- (a) Generator KW
- (b) Generator voltage
- (c) Engine speed (RPM)
- (d) Engine lube oil entering and leaving temperatures
- (e) Engine jacket water inlet and outlet temperatures
- (f) Engine exhaust temperature of each cylinder
- (g) Ambient temperature.

18.6.2 Run-In Period: The engine shall be run-in at a loading specified by the Contracting Officer for not less than 2 hours prior to the beginning of load test runs. During this time, all instruments, controls, temperatures and pressures shall be adjusted to normal and shall be so certified by the Contractor.

18.6.3 50 per cent Rated Load Run: The engine shall be operated at 50 per cent load for a period of 4 hours.

18.6.4 100 per cent Rated Load Run: The engine shall be run at 100 per cent load for a period of 4 hours.

18.6.5 110 per cent Rated Load Run: The engine shall be run at 110 per cent for a period of 2 hours.

18.6.6 Parallel Operation: Parallel operation test will be required to operate the new generating unit with the existing generating units in the plant. Parallel operation test shall be conducted by running a full load test on the generators success-fully for a period of four hours simultaneously within the speed and voltage specified. At the end of four hours parallel operation at 100 per cent full load the load shall be reduced and proportionally shared by the engines in operation as follows:

- (a) Run new engine with one existing engine 100 per cent load for fifteen minutes.
- (b) Reduce existing engine load to 50 per cent load and re-adjust new engine until load is shared proportionally, then run engines for fifteen minutes.
- (c) Continue same test (a) and (b) above running new unit with one or more existing units.

18.6.7 Additional Tests: Upon completion of all load runs, the following safety controls and alarms shall be tested on the new generating unit.

- (a) Increase engine speed manually and note RPM at which overspeed trip functions.
- (b) Adjust jacket water temperatures above normal and note temperature at which safety alarm functions.
- (c) During the shutting down-sequence on the engine, note the pressure at which lube oil low pressure alarm functions.

18.7 ELECTRICAL LOAD: The Contractor may use the electrical load of the facility by arrangement as required for testing purposes.

18.8 OPERATIONS MANUALS: Four copies of complete operating instructions and maintenance manuals along with a parts manual and wiring diagram shall be bound together and furnished to the Contracting Officer.

18.9 GUARANTEE: The complete installations shall be guaranteed by the Contractor for one year against defective parts, materials and workmanship.

- End of Section -